2. Typical Lean Concepts

Before we venture into specific lean concepts, it must be communicated that these tools are used to solve specific business problems. For example, you would never use a hammer to unscrew a nut, and lean tools are no different. You would not use value stream mapping to determine the root cause of a particular failure in a gearbox. These tools are simple to use when you know where and when to apply them.

2.1. Value Stream Mapping: Identifying Process Gaps

Value stream mapping is a lean method used to analyze the current state of function in a value chain and design an optimized future state. A value chain is any process or series of physical events that delivers a product or service to a customer. Value stream mapping seeks to identify each task that discretely adds value to the overall process, displaying the measured time, labor, information, and material inputs and outputs of each task. The value stream map is based on the concept of one-piece-flow, or following a single ‘component’ through a series of value added steps. Knowing and documenting the current state of a process is the first step in working toward an ideal future state. Understanding the concept of ‘flow’ is also important to the value stream concept, as it seeks to optimize the efficiency of the overall process not the individual efficiencies of every resource involved. This allows the user to visualize where delays and waste may occur in the broader process, even when each sub-task may appear to be optimized.

To create a value stream map, representatives from each functional area in the process should participate. The engagement of the team is key both to ensuring the greatest accuracy and to facilitating conversations that may not occur in the day to day working environment. Not all participants will be able to envision an optimized future state. However, they may be able to identify smaller opportunities to improve flow. It’s desirable for the team to walk and observe first hand the physical process taking place, including measurement of inventory, cycle time, changeover time (duration between locations or events), resources required (number of operators and equipment), utilization of resources, rework or quality metrics, and available working time. Once the current state is measured and an optimized future state is envisioned, the gap between current and future state should be analyzed and an action plan developed to close the gap. Value stream mapping has been known to identify up to 99% of the non-value adding activities embedded in the current state. If done right, this lean method will result in tangible improvement steps that can be prioritized based on return on investment.

2.2. “5 Whys”: Fault Analysis or Root Cause Analysis

"5 Why" analysis is a foundational root cause analysis method designed to be applied more quickly and at a higher frequency than other, more formal root cause analysis tools. The primary goal of the "5 Why" analysis is to get to root cause by repeating the question "Why?" five times. With each consecutive iteration, the troubleshooter is brought closer to root cause. In some cases, multiple root causes can be identified, and each one may have its own series of "Why?". Generally, the fifth "Why?" will point to a process breakdown versus a physical problem. For example, a motor failure due to lack of bearing lubrication may ultimately uncover a faulty preventive maintenance program. "5 Why" analysis is a very good introductory method to other, more sophisticated forms of problem-solving.

2.3. Fishbone Diagrams: Turbine Fault Analysis or Root Cause Analysis

Similar to "5 Why" analysis, fishbone diagrams seek to define and illustrate underlying causes of a defect or source of variation. Fishbone seeks to classify sources of variation into categories such as people, methods, machines, materials, measurements, and environment. This method can be useful when a team is stuck or needs to go beyond the simpler "5 Why" approach and becomes a very good way to visualize multiple variables or root causes to a problem.

2.4. Single Minute Exchange of Die (SMED): Main Component Exchanges and Construction

Single Minute Exchange of Die (SMED) is a system for dramatically reducing the time it takes to complete changeovers. Shigeo Shingo, a Japanese industrial engineer who had a record of accomplishment of helping companies reduce changeover time by a documented 94%, successful implemented a SMED program that had benefits of reducing costs, increasing safety and quality, improving responsiveness to customer demand, reducing inventory levels, and allowing for improved startups.

While it may not be possible to reduce all changeovers to one minute, this process takes the approach that any downtime or non-value added time is eliminated. Like most lean tools, SMED is in other industries outside of just manufacturing. NASCAR™ pit crews, for example, employ SMED to further study and reduce the times of their pit stops. Because SMED is a relatively resource intensive process, sound judgement is necessary in order to determine where it can be best applied.

2.4. Single Minute Exchange of Die (SMED): Main Component Exchanges and Construction
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It may be the case, for example, that there are other areas that should be addressed first before changeovers. If mechanical reliability is a greater loss point than changeovers, it may make more sense to focus on implementing a reliability centered maintenance program before reducing changeovers. In this scenario, changeovers may have additional variability due to mechanical issues that arise and need to be corrected in that downtime.

2.5. Overall Equipment Effectiveness (OEE): Hourly or Energy Based Availability

Overall equipment effectiveness (OEE) is a standard for measuring manufacturing productivity. The concept was developed in the 1960s to evaluate how effectively a manufacturing operation is utilized. Because results are expressed as a percentage of standard, OEE can be compared between different operations or industries. To achieve a score of 100% OEE, a system must run at 100% quality: zero defects, 100% performance, and as fast as system design speed allows. It must also run at 100% availability: no stop time. By measuring OEE and the underlying losses, productivity can be systematically improved. Variances from standard can be graphed in a Pareto diagram, and improvement plans can be made to address the highest impact losses from system performance. Because OEE takes into account all loses, it can be considered a holistic measure of performance.

2.6. 5S (Sort, Set, Shine, Standardize, Sustain): Inventory and Tool Management

5S is a process to reduce waste, improve safety, and optimize productivity through maintaining an orderly workplace and using visual cues to achieve more consistent operational results. 5S addresses many of the eight wastes of production, and many organizations use 5S to set a foundation for developing a continuous improvement culture. 5S is equally applicable and effective in all sectors.

The process was developed in manufacturing and was popularized by Toyota. The term 5S references the first letter of the Japanese words for each step in the process. English translations are not exact but typically maintain the nomenclature. 5S requires the user of a workspace to be directly involved in the organization and sustainability of the process. Consistent utilization of this method can lead to a greatly increased sense of ownership for equipment, with gains in safety, quality, morale, and productivity.